

RADIUS AND REFRACTIVE INDEX OF AQUEOUS INORGANIC AEROSOL  
PARTICLES: ACCURATE APPROXIMATIONS FOR DEPENDENCE  
ON RELATIVE HUMIDITY

Ernie R. Lewis and Stephen E. Schwartz  
Atmospheric Sciences Division  
Brookhaven National Laboratory  
Upton, NY 11973-5000

January 2005

For presentation at the  
2005 ARM Science Team Meeting  
Daytona Beach, FL  
March 14-18, 2005

**ABSTRACT**

The direct influence of aerosol particles on atmospheric radiation through light scattering is determined by their radii and refractive indices, both of which are affected by uptake of water vapor. Previous expressions for these quantities have typically been given in terms of molality or solute mole or mass fraction rather than relative humidity RH, which is the pertinent atmospheric variable. Accurate treatment of the dependencies of these quantities on RH requires consideration also of particle mass (or, equivalently, dry radius) to account for influences of surface tension (Kelvin effect). Here simple expressions are presented for the dependence of radius and index of refraction on RH for a particle of given dry mass, for several inorganic salts and acids of atmospheric importance. These expressions, which are accurate to a few percent over a wide range of RH, are readily applicable in radiation transfer models and climate models.